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On Zonal Protection of Troops and Installations
in the Operational Rear Area by the Forces
of Antiaircraft Missile Units of a Front

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by

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Prior to the appearance of antiaircraft missile units in the composition of the antiair defense (PVO) troops of the ground troops, the principal means of combating the air enemy was antiaircraft artillery and fighter aviation. The antiaircraft artillery units were armed primarily with 37-mm antiaircraft guns with an altitude capability of up to 3,000 m and a range of fire up to 5,000 m, and also with 85-mm antiaircraft guns with an altitude capability of up to 8,000 m and a range of fire up to 12,000 m. One must keep in mind at this point that as the flight altitude of air targets kept increasing, the range of effective fire of antiaircraft artillery (ZA) kept diminishing due to the negative effect of air resistance and gravitational attraction upon the flight of the shell. This factor sharply reduced the probability of hitting a target and led to an increase in the consumption of shells for destruction of a single air target.

The basic principle of the combat employment of AA artillery in the system of antiair defense at that time was the principle of concentration of considerable forces for point protection (obyektivnoye prikrytiye) of large units, troop formations, and important installations in the operational rear area.

It must be noted that, to provide point protection of troops engaged in the organization and conduct of operations, rather large groupings of AA artillery were assembled. For example, during the last year of World War II, fronts conducting operations along the main axes were reinforced with 5 to 7 AA artillery divisions, regardless of the fact that their large units and formations had within their composition 10 to 15 more AA artillery units (not counting the AA weapons of units and subunits).

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In exercises of the postwar period, with a fairly large number of AA artillery units and large units available within the composition of large units and formations, fronts were reinforced with four and sometimes five AA divisions (20 to 25 AA artillery regiments).

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In spite of such a large quantity of AA artillery weapons in the composition of front and army troops, their capabilities for inflicting losses upon the air enemy were quite limited. For example, an army could destroy in its zone up to 16 air targets while repelling 150 to 200, and a front - up to 60 air targets while repelling 600 to 800 targets.

Thus, in spite of the large quantity of AA artillery units within the composition of antiair defense troops of the ground troops, reliable protection for groupings of troops and rear area installations was not assured to an adequate degree. This factor necessitated the employment, for fulfilment of the tasks of antiair defense in operations, of a large portion of the front fighter aviation (2 to 3 fighter aviation divisions) - the main mobile means of antiair defense of troops.

Later on, as new types of weapons were being adopted and conditions of combat activity of troops were changing, the demand for replacement of AA artillery with more effective ground means of combating the air enemy became more persistent. Such means were the antiaircraft missile units.

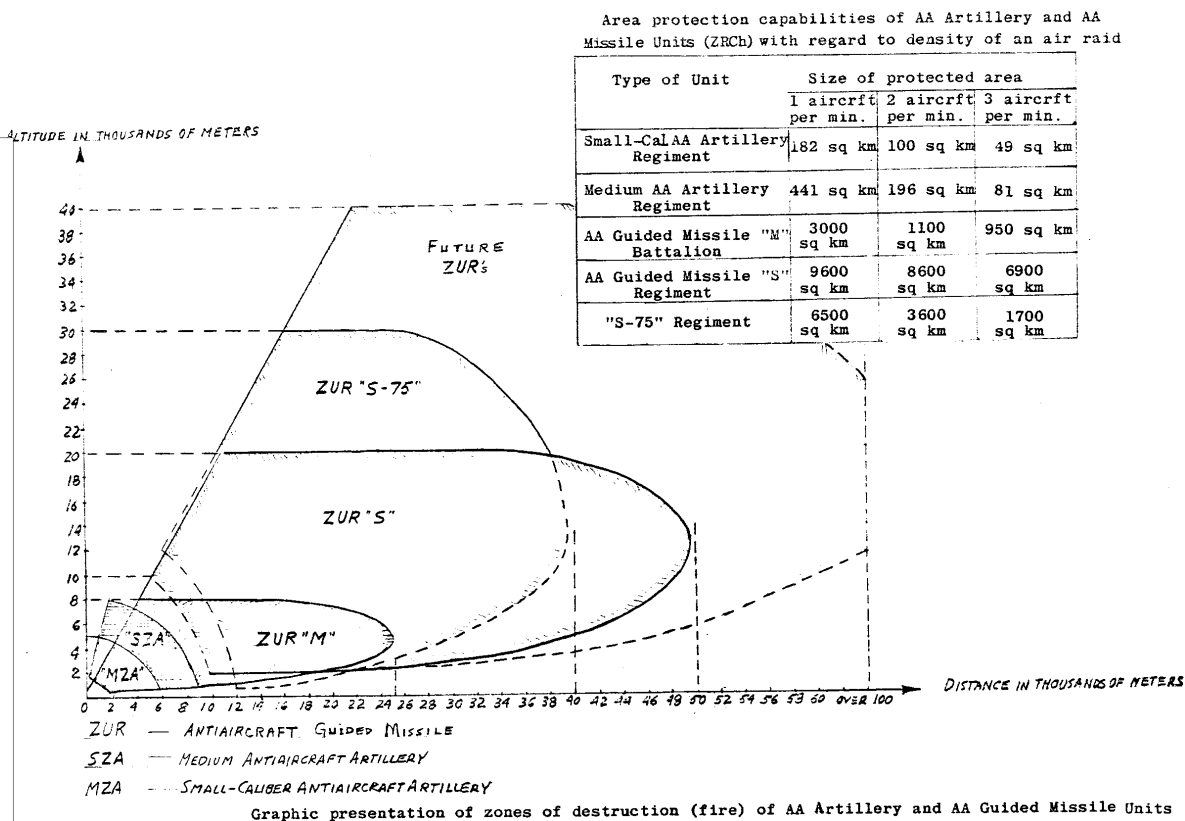
As is known, the antiaircraft missile units of the anti-air defense troops of the ground troops are armed with the "S-75" system using the "V-750M" missile, which can hit air targets at distances of from 12 up to 35 to 40 km, and at altitudes of 1,000 to 30,000 m. Besides, the appearance of a number of other, still more sophisticated, missile systems may be expected in the immediate future.

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The following diagram shows graphically the improvement in the antiair defense of troops as they have been equipped with antiair missile weapons. It can be seen in the diagram that the effective range of fire of antiaircraft missile units has increased 2 to 4 times in comparison with the range of fire of AA artillery, while the altitude of destruction of air targets has increased 2.5 to 3 times.

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Thanks to the increase in range of effective fire of antiaircraft guided missiles, the area of protection has also increased: from 182 km² for a regiment of light antiaircraft artillery (MZA) to 3,000 km² for an antiaircraft missile battalion of type "M", and from 441 km² for a regiment of medium antiaircraft artillery (SZA) to 9,500 km² for an antiaircraft missile regiment of type "S" with a raid density of one air target per minute.

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Besides, due to more powerful antiaircraft guided missile warheads, as well as the possibility of controlling the flight of an antiaircraft guided missile in its trajectory, it has become possible to achieve a sharp increase in the probability of hitting a target (from .5 - 1 percent for AA artillery up to 70 to 80 percent for antiaircraft missile units). Therefore, 3 or 4 antiaircraft guided missiles are used for destruction of one air target at the present time, while in the past up to 400 antiaircraft rounds of medium antiaircraft artillery or 700 rounds of small-caliber AA artillery were used for the same purpose.

The arming of anti-air defense troops of the ground troops with antiaircraft missile units has brought about the necessity of finding new methods of combat employment of the latter in conducting operations. The fact is that due to the increase in the range and power of the actions of an antiaircraft guided missile as compared with an AA shell, there arose the possibility of organizing zonal instead of point antiaircraft missile protection of troops.


By zonal antiaircraft missile protection we mean protection of troop groupings or groups of installations, situated in a large area, by the forces of several antiaircraft missile units forming a single (solid) zone of combat operations on the approaches to and at the objectives being protected. Control of the combat operations of these antiaircraft missile units must be effected from a single command post (an army or front PVO control point may be used as the zone command post).

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Zonal antiaircraft missile protection has many advantages over point protection, which, in our opinion, are as follows:

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- antiaircraft missile units are deployed in several areas, some of which are advanced toward the front and the exposed flanks, thus making it possible to utilize to the utmost the combat capabilities of the units and to inflict losses upon the air enemy while limiting his penetration of the troop disposition area of a front to a minimum;
- it requires a smaller number of antiaircraft missile units;
- it eliminates the necessity for frequent shifting of air targets from fighter planes to antiaircraft missile units, and from one antiaircraft missile unit to another;
- it increases the reliability of hitting air targets due to the possibility of quick concentration of fire of several antiaircraft guided missile subunits or antiaircraft missile units included in the antiaircraft missile zone;
- it provides the best conditions for coordinated action of antiaircraft missile units and fighter aviation both by separating the zones of combat operations of antiaircraft missiles and fighters, as well as by creating better conditions for their operations within the same zone; the antiaircraft missile units may constitute the first echelon of the front PVO while the fighter aviation operating in the depth of the operational formation and on the flanks is the second echelon. However, under favorable conditions fighter aviation can and must operate in the first echelon of front PVO;

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it provides better conditions for operational concealment, as the action of antiaircraft missile units which are not directly connected with groupings of troops and the important installations in the operational rear area does not expose their disposition within the zone of the front;

-- it makes it more difficult for an air enemy to perform a maneuver aimed at enveloping an anti-aircraft missile zone.

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It follows from the above concept of zonal antiaircraft missile protection that a grouping of antiaircraft missile units is formed to provide reliable protection for a group of installations or several groupings of troops, provided that they are situated so that the distances between them do not exceed the size of the antiaircraft missile zone and that organization of reconnaissance of the air enemy and allocation of targets for destruction among the antiaircraft missile units are carried out by a single command post, i.e., by the command post of the zone. This calls for the commander of a zone of antiaircraft missile protection to have at his disposal the appropriate means of reconnaissance of the air enemy, providing for him conditions in which he will be able to appraise a situation and make a decision in advance, and also distribute the air targets among the anti-aircraft missile units in good time. This is fully assured by the creation of a solid radar field by the forces of the radiotechnical units of the front. Besides, the commander of an antiaircraft missile zone should, in our opinion, have at his disposal the necessary means of control in order to be able to assign combat tasks to units at the proper time, and control their fulfilment.

It is advisable, in our opinion, to assign control of combat operations of an antiaircraft missile zone in an army area to the commander of the army PVO troops, and in a front area--to the commander of PVO troops of the front.

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The combining of fighter aviation command posts with control points of front and army PVO, which has been taking place in troop exercises, facilitates effective control of PVO means. However, coordination of antiaircraft missile units and fighter aviation in the same zone will be even more effective if centralized control of all ground PVO means is assigned to the PVO control points, and also if fighter directing points are combined with the command posts of antiaircraft missile units.

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It is advisable in some cases to assign control of combat operations of antiaircraft missile units existing in zones to the PVO commanders of larger units, at the same time strengthening their command subunits with the necessary means of reconnaissance and their staffs with additional personnel.

According to the experience gained from one of the exercises, the reliability of hitting targets participating in a mass raid, with centralized control of missile units, was 29 percent, and with decentralized control--only 19 percent. In a second version of the raid, the reliability in the former case was 28 percent, and in the latter--only 16 percent. This confirms the increase in reliability of hitting the target when centralized control of antiaircraft missile units is used.

We believe that in operations conducted by armies and a front, antiaircraft missile zones may be organized both in the departure position for the offensive and in the course of the offensive with the committing to action of the second echelons and reserves, with the forcing of large water barriers by the troops, or in repelling enemy counterstrikes.

It must be taken into account that the combat effectiveness of zones organized in the course of an operation is somewhat lower than that of zones created in the departure position for the offensive, as part of the subunits of antiaircraft missile units included in the zone, will be executing the maneuver to a new siting area. It is therefore most important to organize this maneuver of antiaircraft missile

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units in such a way as to preclude any sharp decrease in combat effectiveness of antiaircraft zones created for the protection of the main groupings.

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Within the operational zone of a front, several antiaircraft missile zones may be organized, both from the composition of antiaircraft missile battalions of type "M" (minimum strength of a zone--two antiaircraft missile battalions), and sometimes from the composition of antiaircraft missile regiments of the "S" or "S-75" type (minimum strength of a zone--not less than two antiaircraft missile regiments.)

Antiaircraft missile zones organized in the zone of operations of an army will constitute part of the overall antiaircraft missile zone being created within a front.

It should be noted that the space (area) embraced by antiaircraft missile zones of armies, as well as of a front, is smaller in size than the space (area) defined by the operational boundaries and depth of the operational formation of the troops of an army or a front. This factor requires that antiaircraft zones for protection of the main groupings be organized first of all.

During operations conducted by troops of a front, one or several antiaircraft missile zones may be organized, made up primarily of antiaircraft missile regiments of the "S" and "S-75" type. It is advisable to assign control of combat operations of antiaircraft missile zones created for protection of troops of the main grouping and subsequent echelons to the commander of PVO troops of a front and control of combat operations of antiaircraft missile zones of the rear area to the commander of PVO of the rear area, if the latter is included in the T/O of the front field command, or to one of the PVO commanders of an army of the second echelon and, in the last resort, to one of the commanders of antiaircraft missile regiments in a given zone.

It will often be necessary in the course of an operation to provide protection for one or another grouping of troops achieving success on separate axes removed from the main

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grouping of the front. In this case, protection originally organized as zonal may temporarily be converted to zonal-point protection.

Commanders of PVO troops of armies and a front should strive, proceeding from the decisions of the appropriate commanders concerning the conduct of an operation, and depending on the situation, to organize once more zonal antiaircraft missile protection.

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There are two principal viewpoints on the question of coordination of antiaircraft missile units in antiaircraft zones with fighter aviation. The proponents of one view maintain that coordination of antiaircraft missile units with fighter aviation in an antiaircraft missile zone should not be organized, as this reduces the combat capabilities of the coordinated antiaircraft missile units. The proponents of the other side insist that organization of coordination of antiaircraft missile units with fighter aviation in an antiaircraft missile zone is essential.

Coordination of antiaircraft missile units with fighter aviation is organized and carried out in the course of an air battle for the purpose of achieving reliable destruction of the means of air attack, by mutual supplementation of the combat capabilities of the various PVO means disposed along the air enemy's axis of operation.

The organization of coordination of antiaircraft missile units and fighters may be influenced by the existing system of control of these PVO means, i.e., the system of target designation for antiaircraft missile units and the system for directing fighters, the density and formation of the raid, and also the combat capabilities of the antiaircraft missile zone.

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Close coordination of antiaircraft missile units and fighters in the same antiaircraft missile zone is achieved by precision and timeliness of target designation of air targets both to the missile unit command posts as well as to launch subunits, which depends to a large degree on the resolution capabilities of the radar stations.

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Timely evaluation of the combat capabilities of an antiaircraft missile zone allows the determination beforehand of the procedure for committing fighters to combat against the air enemy, while the potential density and formation of an impending raid make it possible to establish those means, or combination of various means, of the PVO, which would be most expedient for repelling a particular raid.

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There is no doubt that the introduction of an automated system of control of the PVO means of the ground troops, the perfection of mutual recognition devices, and equipping them with missile and fighter guidance stations will facilitate successful organization of coordination of antiaircraft missile units and fighter aviation in a single antiaircraft missile zone.

Joint operations within the same antiaircraft missile zone are especially necessary in modern conditions because the air enemy possesses a large quantity of the means of attack and is capable of employing methods of combat operations which can be frustrated only by the united efforts of the various PVO means.

The necessity for coordination of fighters and antiaircraft missile units in one antiaircraft missile zone is proven by the fact that the density of target destruction throughout a zone is unequal, and it is therefore expedient to supplement the inadequate combat capabilities of antiaircraft missile units on separate axes by bringing the fighters into combat operations.

The resolution capability of existing target designation stations and mutual recognition systems as well as calculations, show that fighters, especially those armed with "air-to-air" type missiles, are capable of conducting combat operations in an antiaircraft missile zone. It should be kept in mind that while destroying a collective target, consisting of several pairs (flights) of aircraft, measuring 1,000 to 2,000 m along the front and 2,000 to 3,000 m in depth, fighters may operate by attacking, for example,

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one of the flank or leading groups of aircraft removed from the others a minimum of 200 to 300 m or more, while antiaircraft guided missiles, may, simultaneously with the attack carried out by the fighters, fire on the other (leading) flank group of aircraft, because they as well as the attacking fighters are distinctly "visible" on the radar (RLS) screens. The fighters' safety in this case will be ensured by the fact that they will be attacking a flank or leading group of aircraft at a range of not less than 4 to 6 km, firing their "air-to-air" missiles from a distance of 1.5 to 2 km, while the dispersion of the antiaircraft guided missiles may amount to 300 to 500 m relative to the target under fire, which is removed up to 1,000 m from the target under fighter attack.

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As is known, after executing an attack, fighters "disengage" ("otval") from the target along a specific radius of turn. Thus, figures show that if a fighter is flying at the speed of 900 kmph, and the angle of roll in the turn is 40 degrees, the radius of its turn will be 7.5 km and the time for disengagement is 1.58 minutes. With the speed of a fighter being 1,500 kmph and the angle of roll 40°, the radius of turn will be 14.8 km and the disengagement time 1.87 minutes. Such a distance of the fighter from the target makes it possible to "see" them separately on the radar screens, while the time used by the fighters for disengagement from the target allows the introduction into the combat operations of the antiaircraft missile units. This is the reason why it is expedient, in the interest of applying continuous pressure against the air enemy, to combine fighter aviation direction points with the control points of antiaircraft missile units. This will allow the introduction of other PVO means into combat operations as the means introduced earlier exhaust their combat capabilities.

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Safety of fighters while attacking individual aircraft echeloned in altitude at distances of 300 to 500 m will also be ensured because the launching range of fighters' "air-to-air" missiles exceeds the magnitude of dispersion and fragment spray area of antiaircraft guided missiles when firing,

let us say, at aircraft flying in the lower tier. Besides, under these conditions, again, the target and the fighters may be "seen" on the radar screen, which eliminates the possibility of antiaircraft missile units firing at friendly fighters. 50X1-HUM

Increase in the launching range of "air-to-air" missiles of future fighters, with the same magnitudes of dispersion of antiaircraft guided missiles (300 to 500 m) and the same spray of destructive fragments (70 to 100 m) will ensure the safety of their simultaneous action against an individual target jointly with antiaircraft missile units.

Experience gained from exercises conducted by the PVO Troops of the Country, in which methods of coordination of anti-aircraft missile troops and fighter aviation were developed, in practice confirmed the feasibility of their coordination in the same zone.

Thus, in the exercises of the North Caucasus PVO army in 1960 it was established that the operations of fighters and antiaircraft missile units in the same zone, the zone of combat operations of antiaircraft missile units, are quite feasible and safe. However, in order to employ this method successfully, certain specific conditions must be strictly observed, namely: radar stations for target detection and direction of antiaircraft guided missiles must provide identification and separate observation of fighters and targets, while fighters must terminate their attacks against air targets at distances exceeding, in our opinion, several times over the lethal radius of antiaircraft missiles (not less than 1000 m).

It should be noted that the possibility of coordination of antiaircraft missile units and fighter aviation in the same zone is also confirmed by American data, but with targets distributed in a vertical plane with appropriate intervals between them of approximately 300 to 500 m. 50X1-HUM

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Thus, from the technical point of view, coordination of antiaircraft missile units and fighter aviation in the same zone are completely feasible. Further improvement of equipment, ensuring such coordination must be directed toward developing a recognition system both for missile directing stations of antiaircraft missile units and for front fighters, and also developing a technical means of communications to ensure coordination communications between command posts of antiaircraft missile zones and command posts of fighter aviation large units (units). 50X1-HUM

Some of the theoretical tenets discussed by us were confirmed in special exercises dealing with coordination which were conducted with the troops of PVO of the Country. But these exercises are characterized by the stationary conditions of deployment of antiaircraft missile units of the PVO of the Country. Therefore, it would be advisable, during exercises conducted by the ground troops, to check the tenets advanced on organization and conduct of zonal anti-aircraft missile protection in operations, by actually creating a zone made up of two or three "S-75" antiaircraft missile regiments. This kind of practical study of the organization and conduct of zonal antiaircraft missile protection in operations would help to develop a unified opinion on this matter.

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